

Remarks on the Genus *Pettiboneia* (Polychaeta: Dorvilleidae) with Descriptions of Two New Species

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Abstract.—Two new species of the genus *Pettiboneia* Orensanz, 1973, are described from the North Pacific and North Atlantic Oceans. Comments on within-species variability, generic relationships, and species distributions are presented, and a key to the species of *Pettiboneia* is provided.

The genus *Pettiboneia* Orensanz, 1973, was originally described from seven specimens found in shallow water in the Gulf of San Matías, Argentina. Members of the genus are very small, typically averaging only about 5 mm in length, and are easily overlooked. However, within the last decade an additional four species have been discovered, all in intertidal to shelf depths, and in tropical or subtropical waters. Blake and Hilbig (this issue) are transferring two additional species originally described as *Protodorvillea* to the genus. In this paper two new species from Alaska and from the western North Atlantic are described. These species are from deeper and more northern waters than previously reported, raising the number of species of *Pettiboneia* to nine.

The Alaskan specimens were collected as part of a monitoring study conducted in two southeast Alaska fjords between 1979–1983. The Atlantic specimens were collected on the continental slope and rise between Cape Cod, Massachusetts, and Cape Lookout, North Carolina, between 1982–1986.

The holotype and some paratypes are deposited in the U.S. National Museum of Natural History (USNM). Additional paratypes are deposited in the British Museum of Natural History (BMNH) and in the Zoological Museum of the University of Hamburg (ZMH). Some specimens have been retained by the authors or have been transferred to the Smithsonian Institution.

Pettiboneia brevipalpa n. sp.

Figure 1

Pettiboneia sp.—VTN Consolidated, Inc., 1980.

Material examined.—Boca de Quadra, Alaska: Sta. 200, 55°18.1'N, 130°30.6'W, 150 m, Apr 1980, 3 paratypes (USNM 130085); Jul 1980, 1 paratype (USNM 130086). Sta. 201, 55°18.3'N, 130°30.9'W, 145 m, Apr 1980, 1 paratype (USNM 130087). Sta. 277, 55°18.1'N, 130°30.6'W, 150 m, Sep 1983, 1 paratype (USNM 130088). Sta. 400, 55°16.7'N, 130°31.9'W, 150 m, Apr 1980, 3 specimens. Sta. 401, 55°16.7'N, 130°32.1'W, 140 m, Apr 1980, 1 paratype (USNM 130089); Jul

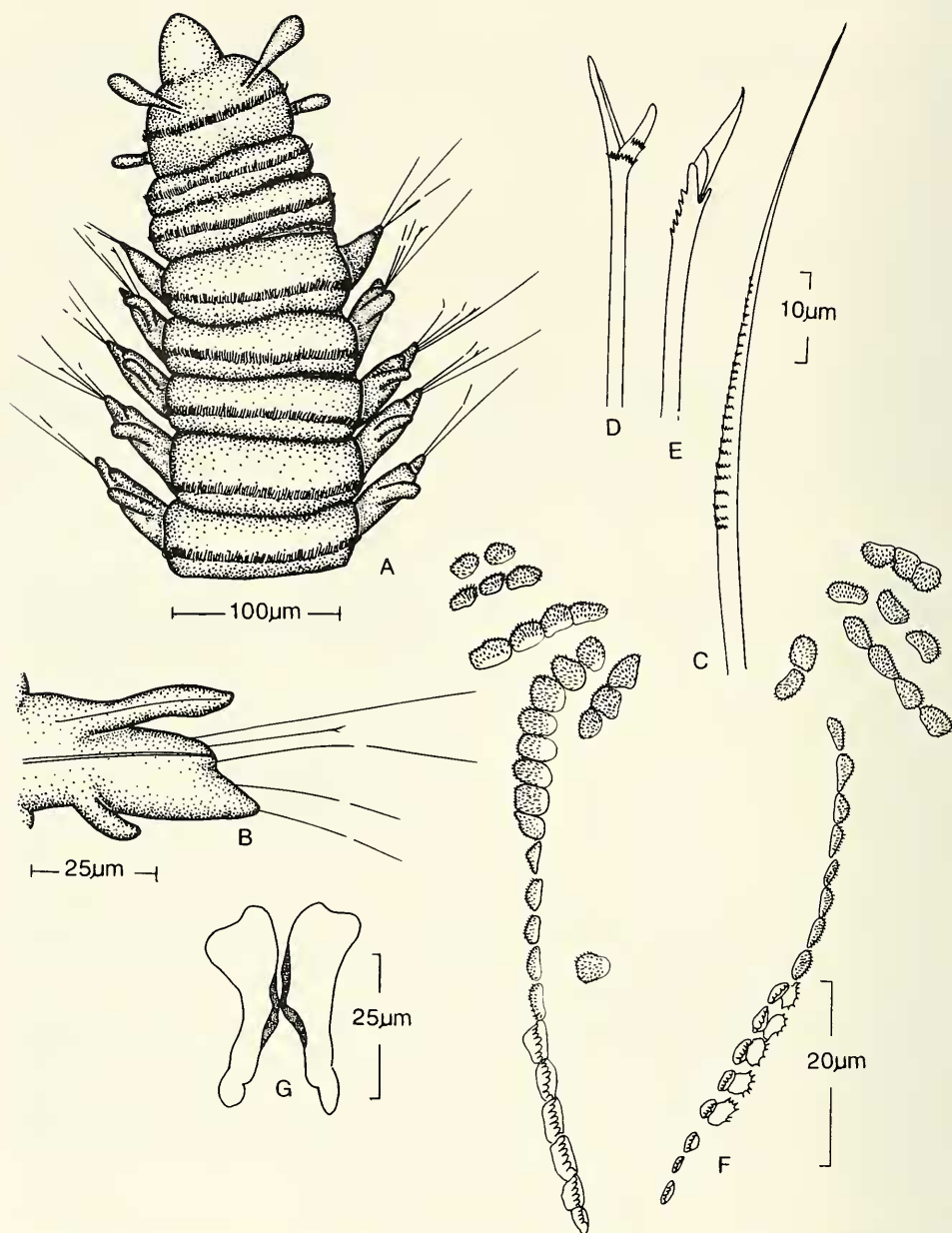


Fig. 1. *Pettiboneia brevivalpa*: A, anterior end, dorsal view; B, parapodium; C, capillary supraacicular seta; D, furcate supraacicular seta; E, subacicular seta; F, maxillae; G, mandibles.

1980, 2 paratypes (ZMH P-20324). Sta. 500, 55°15.1'N, 130°33.1'W, 210 m, Apr 1980, 2 specimens; Jul 1980, 3 specimens. Sta. 501, 55°15.0'N, 130°32.8'W, 195 m, Jul 1980, 1 specimen. Sta. 502, 55°14.9'N, 130°32.6'W, 195 m, Jul 1980, 1 specimen. Sta. 600, 55°12.4'N, 130°35.8'W, 280 m, Jul 1980, 1 specimen. Sta. 601, 55°12.6'N, 130°36.1'W, 275 m, Jul 1980, 3 specimens. Sta. 602, 55°12.3'N,

130°35.5'W, 275 m, Jul 1980, 3 paratypes (BMNH ZB 1990.29–31). Sta. 700, 55°10.2'N, 130°39.3'W, 280 m, Apr 1980, holotype (USNM 130084); Jul 1980, 5 paratypes (USNM 130090). Sta. 800, 55°05.9'N, 130°43.5'W, 330 m, Apr 1980, 3 paratypes (USNM 130091). Sta. 801, 55°06.1'N, 130°43.9'W, 330 m, Apr 1980, 1 specimen. Sta. 802, 55°05.7'N, 130°43.3'W, 380 m, Jul 1980, 1 paratype (ZMH P-20325).—Smeaton Bay, Alaska. Sta. 010, 55°18.7'N, 130°41.4'W, 241 m, Oct 1980, 1 paratype (BMNH ZB 1990.32).

Description.—Holotype complete, 2.4 mm long, 0.1 mm wide for 35 setigers. Other complete specimens up to 4.5 mm long for 66 setigers. Body slender, fragile, unpigmented in alcohol. Prostomium pear-shaped, about as long as wide (Fig. 1A); antennae clavate, about as long as greatest prostomial width; biarticulate palps half antennal length, inserted ventrolaterally behind antennae, with short, inconspicuous palpophores; eyes absent; narrow band of cilia encircling prostomium between antennae and palps; large yellowish-brown nuchal organs on posterior margins of prostomium. Two subequal asetigerous peristomial rings, shorter than setigerous segments; complete ciliary bands on both rings and on anterior setigers.

Cirriiform notopodia with embedded acicula present from setiger 2 through setigers 8–11; absent posteriorly; as long as or slightly longer than neuropodial acicular lobe. Neuropodia with conical acicular lobe and inferior retractable setal lobe supported by inferiormost seta (Fig. 1B); ventral cirri short, cirriiform.

Supraacicular setae include 1–3 serrated capillary setae (Fig. 1C) and 1 (occasionally 2) furcate seta with unequal tines and 1–2 rows of fine serrations below shorter tine; longer tine with delicate wing on inner side (Fig. 1D). Subacicular fascicle with 2–4 compound setae having long to short unidentate, finely serrated blades; shafts bifid with coarse subdistal serrations (Fig. 1E). Far posterior setigers occasionally with simple pointed inferior setae.

Pygidium rounded, longer than preceding setigers, with 2 pairs of clavate subterminal cirri.

Maxillae with two main rows of free denticles and about six additional rows on each side; maxillary carriers and basal plates absent (Fig. 1F). Basal teeth of main rows smooth, delicate, rounded plates with serrated cutting edge; middle and upper teeth rounded plates covered with surficial spines. Teeth of additional rows including smooth, anteriorly serrated plates proximally and spinose plates distally. Mandibles elongate, slightly curved, anteriorly flared, smooth and weakly incised (Fig. 1G).

Remarks.—*Pettiboneia brevipalpa* is similar to *P. sanmatiensis* in the number of notopodia, the shape of the prostomium, the number of maxillary rows, and the size and shape of the pygidial cirri. It differs from the latter species in lacking eyes and in having long rather than short notopodia. In addition, *P. brevipalpa* differs from all other known species in possessing palps that are much shorter than the antennae, and palpophores shorter than the palpostyles.

Of the 42 specimens examined, eight were gravid females and ten appeared to be developing or mature males. There are up to 8 round or elongated eggs per setiger averaging 40 μm in length and 27 μm in width. The eggs are first present between setigers 14–21, and the sperm appear between setigers 15–19. The gametes are associated with the bases of the parapodia and continue for most of the length of the worm.

Etymology.—The specific name refers to the unique short palps which distinguish this species from its congeners.

Distribution.—Known only from Boca de Quadra and Smeaton Bay in the Alaskan panhandle, 140–380 m, in fine silts. This is the northernmost record for the genus.

Pettiboneia bathyalis n. sp.

Figure 2

Pettiboneia sp. 1.—Blake et al. 1987; Maciolek et al. 1987a, b.

Material examined.—U.S. Atlantic Continental Slope and Rise Program, off New England, Sta. N2, 40°57.2'N, 66°13.9'W, 2100 m, Nov 1984, 1 specimen; Apr 1986, 1 specimen. Sta. N8, 40°10.3'N, 67°37.4'W, 2180 m, Nov 1984, 1 paratype (USNM 130093); Apr 1986, 1 paratype (ZMH P-20326). Sta. N13, 39°48.4'N, 70°54.3'W, 1250 m, Nov 1985, 1 specimen. Sta. N14, 39°41.0'N, 70°54.3'W, 2105 m, Nov 1984, 1 specimen.—Off Delaware and New Jersey: Sta. M1, 38°36.0'N, 72°53.0'W, 2195 m, Aug 1984, 1 specimen; Dec 1984, 2 paratypes (USNM 130094); Aug 1985, 1 paratype (USNM 130095). Sta. M2, 38°35.8'N, 72°53.7'W, 2020 m, Aug 1984, 2 specimens; Aug 1985, 1 specimen; Nov 1985, holotype (USNM 130092), 2 paratypes (USNM 130096). Sta. M3, 38°36.8'N, 72°51.4'W, 2055 m, May 1984, 1 specimen; Dec 1984, 1 specimen. Sta. M4, 38°44.5'N, 72°33.0'W, 2100 m, May 1984, 1 specimen; Dec 1984, 1 specimen. Sta. M5, 38°50.5'N, 72°33.0'W, 2065 m, Nov 1985, 1 specimen. Sta. M6, 39°05.5'N, 72°03.0'W, 2090 m, Nov 1984, 1 specimen. Sta. M7, 38°27.4'N, 73°03.4'W, 2100 m, Dec 1984, 1 specimen; Aug 1985, 2 paratypes (BMNH ZB 1990.33–34), 1 specimen. Sta. M9, 38°17.3'N, 73°14.5'W, 2105 m, May 1984, 4 paratypes (ZMH P-20327); Aug 1984, 2 specimens; Nov 1984, 5 paratypes (USNM 130097), 2 specimens; May 1985, 4 specimens; Aug 1985, 3 paratypes (USNM 130098); Nov 1985, 1 specimen. Sta. M10, 37°51.8'N, 73°19.8'W, 2095 m, May 1984, 1 specimen; Aug 1985, 1 specimen. Sta. M11, 38°40.2'N, 72°42.2'W, 1515 m, Aug 1984, 1 specimen; Dec 1984, 1 specimen. Sta. M12, 38°29.3'N, 72°42.2'W, 2505 m, Dec 1984, 1 specimen. Sta. M13, 37°53.3'N, 73°45.1'W, 1613 m, Nov 1984, 3 specimens; May 1985, 3 specimens; Nov 1985, 1 specimen.—Off North Carolina: Sta. S3, 34°14.8'N, 75°40.1'W, 1500 m, Mar 1984, 1 specimen. Sta. S4, 34°11.4'N, 75°38.8'W, 2000 m, May 1984, 1 specimen; Sep 1985, 2 paratypes (USNM 130099); Nov 1985, 6 paratypes (BMNH ZB 1990.35–40). Sta. S6, 34°49.5'N, 75°13.4'W, 2004 m, May 1984, 5 specimens; July 1984, 3 specimens. Sta. S10, 35°26.3'N, 74°41.4'W, 2003 m, Nov 1985, 4 specimens. Sta. S12, 33°00.3'N, 76°07.4'W, 1996 m, Nov 1985, 1 paratype (USNM 130100). Sta. S14, 32°23.6'N, 77°01.1'W, 805 m, Nov 1985, 1 specimen.

Description.—Holotype complete, 5.5 mm long, 0.3 mm wide for 65 setigers. Other complete specimens to 6.0 mm long with up to 70 setigers. Body stout, dorsoventrally compressed, unpigmented in alcohol.

Prostomium broadly rounded anteriorly, slightly wider than long, with two ciliary bands straddling antennae (Fig. 2A); antennae short, smooth, slightly clavate, half as long as prostomial width; palps longer, biarticulate, with elongate palpostyles; eyes absent. First peristomial ring short, about as wide as prostomium, often telescoped beneath the second, wider, longer ring; each ring with ciliary band close to posterior margin.

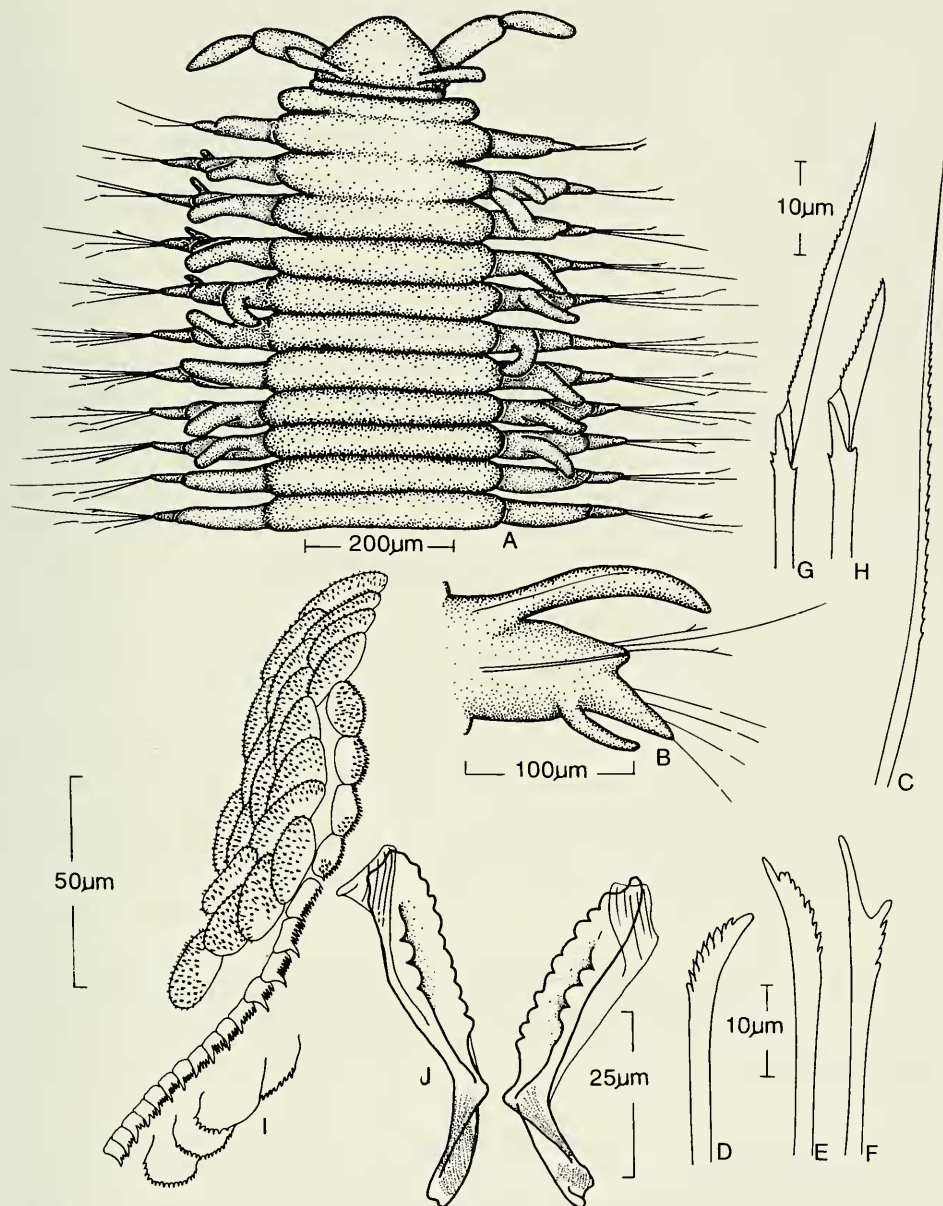


Fig. 2. *Pettiboneia bathyalis*: A, anterior end, dorsal view, ciliation not shown; B, parapodium; C, capillary supraacicular seta; D, geniculate supraacicular seta, setiger 1; E, geniculate supraacicular seta, setiger 3; F, furcate supraacicular seta, setiger 5; G, subacicular seta, middle position; H, subacicular seta, inferiormost position; I, maxillae; J, mandibles.

Cirriform aciculate notopodia present from setiger 2 through setigers 7–9. Neuropodia with acicular lobe and retractable inferior setal lobe; filiform ventral cirri inserted subdistally, extending beyond acicular lobe (Fig. 2B).

Supraacicular fascicles with 1–3 capillary setae (Fig. 2C) and 1–2 bifid, serrated geniculate setae in anteriormost parapodia (Fig. 2D); geniculate setae progressively

changing within anterior 5 setigers to furcate setae having unequal truncate tines (Fig. 2E, F); shaft coarsely serrated below shorter tine. Subacicular fascicles with 3–4 compound setae having finely serrated falcigerous blades; serrations longer than blade width; inferior blades shortest; shaft with a few coarse subdistal teeth (Fig. 2G, H). Posterior setigers occasionally with simple cultriform seta in ventralmost position.

Pre-pygidial setigers short. Pygidium wider than long, with 2 pairs of clavate subterminal cirri; dorsal pair longest.

Maxillae consisting of two main rows of free denticles and numerous additional denticles arranged in 6–8 rows on each side; maxillary carriers and basal plates absent (Fig. 2I). Basal teeth of main rows smooth, rounded plates with finely serrated cutting edge; middle teeth smooth, rectangular, with proximal main fang and coarsely serrated cutting edge; anterior teeth oval plates with surficial spines, proximal main fang and coarsely serrated cutting edge; main fang lacking in last 1–4 denticles. Denticles of additional rows large, delicate, rectangular to oval plates with surficial spines and finely serrated cutting edge, arranged in several imbricated distal rows and one proximal row on each side. Mandibles L-shaped with short, sclerotized handle and long, delicate, scoop-shaped cutting edge with 10–12 rounded teeth in one row and 2–3 teeth in additional rows (Fig. 2J).

Remarks.—*Pettiboneia bathyalis* appears to be close to *P. urciensis* in prostomial shape and number of notopodia. It differs from the latter species in lacking eyes and in having elongated palpostyles. *P. bathyalis* differs from its congeners in possessing geniculate rather than furcate setae in the anteriormost setigers.

Of the 83 specimens examined, 8 were gravid females and 19 were males. The eggs are irregularly polygonal in shape, averaging 116 μm in the longest dimension. There are about 8 eggs per segment after setiger 10 packed across the ventrum and extending into the parapodia. Sperm occur from setigers 13–20, continuing to near the end of the body.

Etymology.—The species name refers to the bathyal regions where it was collected.

Distribution.—*P. bathyalis* is distributed from Cape Cod, Massachusetts, to Cape Lookout, North Carolina, 800–2500 m, in muddy sands. This is the first deep-sea species of *Pettiboneia* discovered, and the first record for the western North Atlantic.

Discussion

The diagnostic characters delineating the genus *Pettiboneia* were provided by Orensanz (1973), and the structure of the jaw apparatus was elucidated by Blake (1979). The two new species conform well to the genus concept as reviewed by Wolf (1987) with the exception that in *P. brevipalpa* the biarticulate palps are distinctly shorter than the antennae. The generic diagnosis should therefore be emended to encompass this feature.

Abundant material permitted a detailed assessment of within-species character variability. Many features, such as the shape of the prostomium, the length of the palps and antennae, and the length of the notopodia relative to the neuropodia, were found to be relatively constant within each species. The ciliary bands also appeared to be invariable, although these features were not always discernible.

Examination of the jaw apparatus of at least ten specimens of each species

revealed very different appearances of the maxillary arrangement. The apparent number of maxillary rows varied between 8 and 14, and in most cases these rows were only discernible in the anterior part of the pharynx. The differences seemed to be a function of the maceration of the very thick pharyngeal muscle rather than reflecting a real morphological variability. The arrangement of maxillary plates as a diagnostic character on the species level should therefore be used with caution until the true morphology of the jaw apparatus can be revealed. Examination of dissected and dorsally opened pharynges with SEM may be an appropriate technique.

Anterior notopodia begin on setiger 2 and generally extend through setiger 11 in *P. brevipalpa* and through setiger 9 in *P. bathyalis*. However, in a number of specimens the posteriormost 1 to 3 notopodia were not observed (Table 1). Since these structures are supported by an internal acicula and do not tend to be deciduous, the variability in the total number of notopodia appears to be a real feature rather than an artifact.

All of the neuropodia possess an inferior setal lobe supported by the ventralmost seta, a feature that has not been reported in the descriptions of other species within the genus. The length of this lobe was often variable in adjacent parapodia, and at times it was inconspicuous. This feature appears to reflect the degree of extension of the ventral seta, and the length is therefore an artifact of preservation.

The inferior setal lobe is supported by a simple pointed seta rather than a compound falciger in the posterior setigers of about half of the examined specimens of *P. brevipalpa* and about a quarter of the *P. bathyalis* material. The setiger of its first occurrence varies greatly, and the seta is not always present in all consecutive setigers. Similar simple inferior setae have also been noted in other dorvilleid genera such as *Ophryotrocha* (Hilbig and Blake in press). The retractable setal lobe is also present in many of the species within that genus, although it has often been overlooked in the past (Hilbig and Blake in press). These two features appear to be widespread among dorvilleids and may represent plesiomorphic characters.

The change from serrated bidentate geniculate setae to short-tined furcate setae noted in the anterior region of *Pettiboneia bathyalis* is also known from *Dorvillea rudolphi* and an undescribed Atlantic deep-sea species of *Meiodorvillea* reported in Blake et al. 1987, and Maciolek et al. 1987a, b, indicating a close relationship between these genera. The relationship between *Pettiboneia* and *Meiodorvillea* is further confirmed by the absence of maxillary carriers and basal plates and the presence of surficial spines on the anteriormost maxillary plates of *Meiodorvillea minuta*.

With recent discoveries, it appears that the genus *Pettiboneia* is widely distributed throughout the world's oceans (Fig. 3). A total of nine species are now known from tropical habitats to boreal waters, and from the shallow subtidal to depths exceeding 2500 m.

Key to the known species of *Pettiboneia*

- | | |
|--|--|
| 1a. Eyes present | 2 |
| 1b. Eyes absent | 5 |
| 2a. Notopodia beginning on setiger 3; peristomial rings fused dorsally ... | |
| | <i>P. pugettensis</i> (Armstrong & Jumars, 1978) |

- 2b. Notopodia beginning on setiger 2; peristomial rings distinct and not fused dorsally 3
- 3a. Notopodia shorter than neuropodia; furcate setae with subequal tines *P. sanmatiensis* Orensanz, 1973
- 3b. Notopodia as long or longer than neuropodia; furcate setae with unequal tines 4
- 4a. Prostomium pear-shaped; eyes large, situated behind antennae *P. blakei* Wolf, 1987
- 4b. Prostomium rounded; eyes small, situated in front of antennae *P. urciensis* Campoy & San Martin, 1980
- 5a. Prostomium pear-shaped; palps shorter than antennae . . . *P. brevipalpa* n. sp.
- 5b. Prostomium rounded; palps longer than antennae 6
- 6a. Notopodia longer than neuropodia; anterior neuropodia with superior branchiae 7
- 6b. Notopodia subequal to neuropodia; anterior neuropodia without superior branchiae 8
- 7a. Branchiae beginning on setiger 1; notopodia extending through setigers 13-17; all anal cirri short . . . *P. dibranchiata* (Armstrong & Jumars, 1978)
- 7b. Branchiae beginning on setiger 3; notopodia extending through setigers 8-9; dorsal anal cirri long *P. duofurca* Wolf, 1987
- 8a. Notopodia extending through setiger 9; furcate setae in median setigers serrated, with unequal tines *P. bathyalis* n. sp.
- 8b. Notopodia extending through setiger 19; furcate setae in median setigers smooth, with subequal tines *P. australiensis* Westheide & von Nordheim, 1985

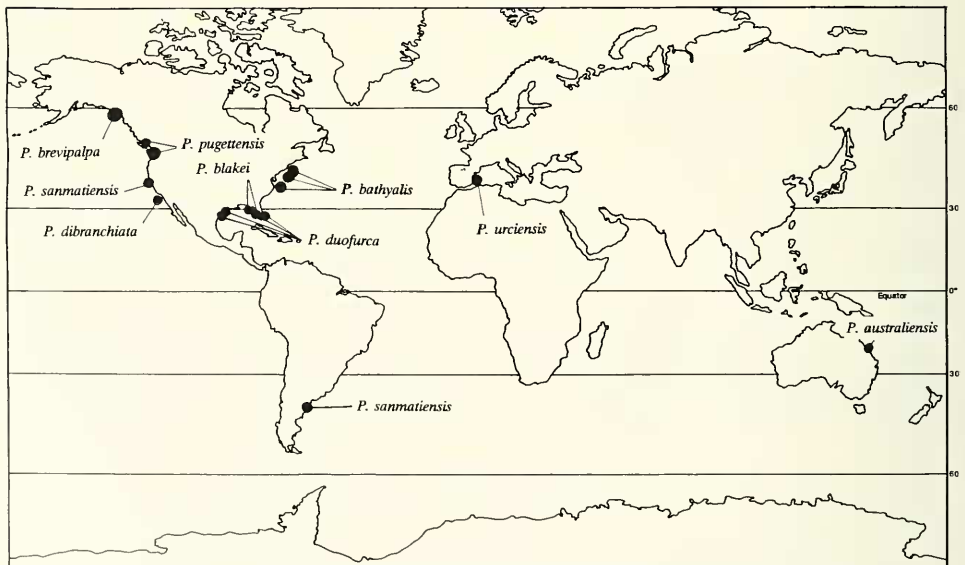


Fig. 3. Worldwide distribution of species of *Pettiboneia*.

Table 1. Distribution of notopodia in the anterior setigers of *P. bathyalis* and *P. brevipalpa*.

Last setiger bearing notopodia	Number of specimens	
	<i>P. bathyalis</i>	<i>P. brevipalpa</i>
7	6	—
8	9	4
9	39	12
10	—	7
11	—	17

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